Coast 2050 Region 3

TIMBALIER ISLAND PLANTINGS (TE-18) DEMONSTRATION PROJECT
TE-18-MSPR-0698-5
PROGRESS REPORT NO. 5
for the period
July 2, 1996 to June 10, 1998

Project Status

The following data collection has been conducted by the Louisiana Department of Natural Resources /Coastal Restoration Division (LDNR/CRD) and the Natural Resources Conservation Service (NRCS) since the previous progress report.

Vegetation sampling of the project sites and reference areas took place in August 1997. Elevation data was collected in July/August 1997.

Project Description

Timbalier Island is part of the chain of barrier islands bordering Timbalier Bay in Terrebonne Parish. The island has decreased in size by 58% over the last century (Hester and Mendelssohn 1992) and island width has decreased from an average 2,789.5 ft to 1,361.9 ft (850.2 m to 415.1 m) between 1978 and 1988 (Williams et al. 1992). The dunes of Timbalier Island are not well developed and are less than 6.5 ft (1.98 m) above mean sea level (MSL). These factors leave the island highly susceptible to erosion, storm overwash, and breaching. Stabilized sand dunes reduce the likelihood of island breaching and erosion from wave action, storm waves and surges (Mendelssohn and Hester 1988; Mendelssohn et al. 1991).

The goal of the Timbalier Island Plantings (TE-18) Demonstration project is to stabilize portions of bare beach and overwash areas on Timbalier Island by utilizing sediment-trapping fences and vegetation plantings (figure 1). The specific goals of the project are (1) to increase the percent cover of emergent vegetation behind the sediment-trapping fences and (2) to increase the elevation of areas enclosed by the sediment-trapping fences.

Project goals were to be accomplished by construction of approximately 7,390 linear ft (2,252 m) of sand fencing at seven sites along the length of the island, parallel to the Gulf of Mexico shoreline (figure 1). Each fence site has perpendicular spurs every 50 ft (15.2 m) that extend 25 ft (7.6 m) from the fence bayward (figure 2). *Spartina patens* (marshhay cordgrass) and *Panicum amarum* (bitter panicum) were planted on the bay side of the fences between the perpendicular spurs as indicated by the planting scheme (figure 3) . Minor changes were made in the planting scheme at the time of planting, which took place under the supervision of NRCS in July 1996. Site A was planted as prescribed. No plantings took place in sites C, D, and E since vegetation was naturally colonizing the sites. Site B was planted on the eastern and western ends, referred to as BE and BW respectively, while the middle section of the site was not planted since it was naturally vegetated. Due to erosion of the eastern end of the island before the fences were completed, sites I-1 and I-2 were planted without fences and bayward of the site originally chosen for their location.

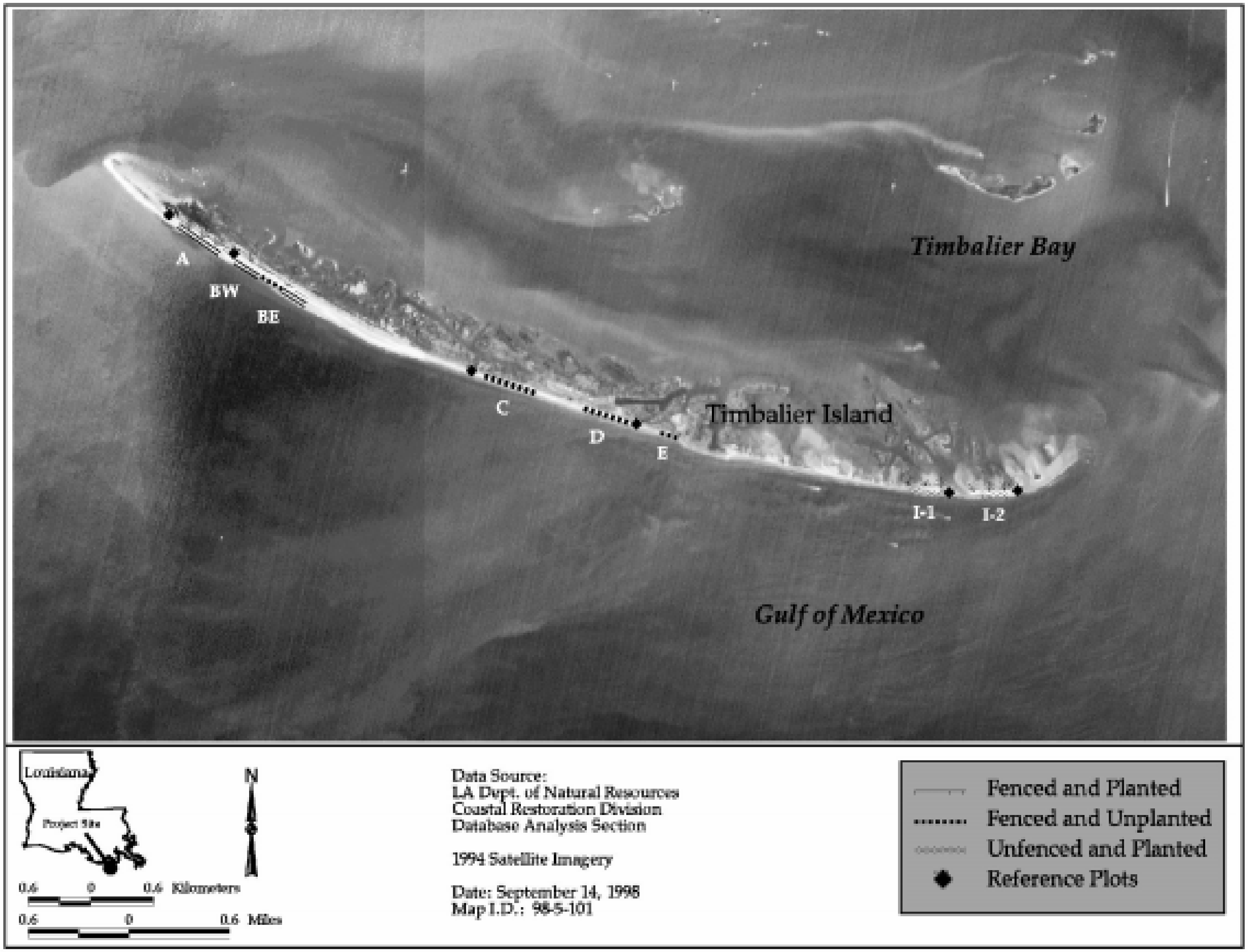

Figure 1. Timbalier Island Plantings (TE-18) Demonstration project features.

Figure 2. Typical sand fencing with perpendicular spurs at Timbalier Island Plantings (TE-18) Demonstration project (photo taken August 1996).

During the summer storm season of 1995, several tropical storms impacted the Louisiana coastal area, including Timbalier Island, causing extensive damage to the sediment-trapping fences and natural vegetation. In June 1996, the damage to constructed fences was repaired, but sites I-1 and I-2 remained unfenced (figure 1).

In October 1996, tropical storm Josephine passed near the Louisiana coast and impacted many of the Louisiana barrier islands, including Timbalier Island. During a trip to the island in late October 1996, NRCS and LDNR/CRD personnel found that damage to the Timbalier Island Plantings (TE-18) Demonstration project varied, ranging from extensive overwash and complete destruction of the vegetation at sites E, I-1, and I-2 on the eastern end of the island to saltwater burn of the vegetation and partial destruction of some of the sand fencing in sites C and D in the central island area. Sediment appeared to accumulate around the fencing at the eastern end of site C as a result of the hurricane. Sites A and B on the western end of the island had little damage to the fencing, but experienced some saltwater damage to the plants. The majority of plants with saltwater damage showed signs of new growth within one month after the storm. Varying degrees of beach erosion were observed, with the most beach and fencing damage occurring on the eastern end of the island and diminishing toward the west.

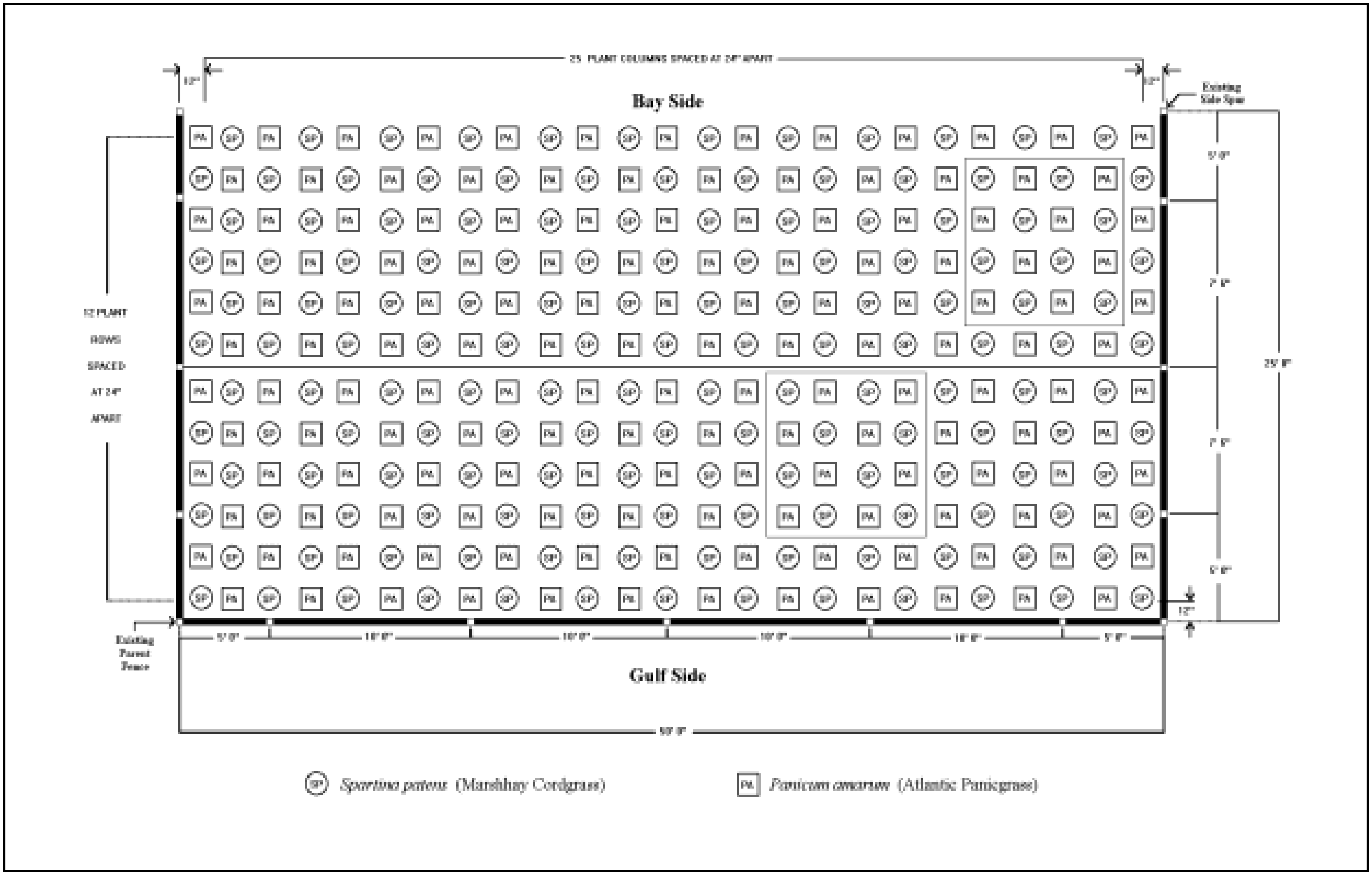

Figure 3. Typical layout for vegetation plantings within a 50 ft segment (fenced or unfenced) including randomly placed 2 m x 2 m vegetation plots at Timbalier Island Plantings (TE-18) Demonstration project.

Between December 1996 and March 1997, observations of the project made from the Gulf of Mexico by NRCS personnel indicated that the project had been impacted by winter storms. The impact from winter storms ranged from minimal to devastating among the remaining segments resulting in damage to both vegetation plantings and fencing. Approximately 75% of the fencing and vegetation at site D was destroyed or damaged while approximately 50% of site BE suffered similar damage. The remaining two sites, A and C, appeared to have suffered minimal damage (Garber 1997).

Between April and August of 1997, the sites sustained additional damage especially from tropical storm Danny as it passed near Timbalier Island. Sites C and D, the easternmost sites, incurred varying amounts of damage. Site D was completely destroyed and site C was partially cleared of vegetation and fencing (figure 4). All of the BE segments were severely damaged or destroyed by storm activity which left large amounts of debris and fencing material deposited within the sites making plant counts and identification difficult as well as incomparable to undamaged sites (figure 5). Sites A and BW were not damaged and were the only sites intact at the time of the 1997 sampling.

Methods

Raynie (1995, revised 1998) provides a detailed description of the monitoring design over the entire life of the project.

Vegetation sampling was conducted one month post-construction in August 1996 and one year post-construction in August 1997 by LDNR/CRD personnel. Vegetation was sampled at two randomly placed permanent plots, one bayside and one gulfside, within each segment of the planted sites (figure 3). Plots were given the treatment designation of "bayside" or "gulfside," based on the location of the plants with respect to the center line of the fence and the Gulf of Mexico (figure 3). From all 126 plots, percent survival of planted individuals was determined and two plants within each plot were randomly selected to determine tiller number and tiller length. In addition, percent cover of plants and plant species composition were determined in a 0.5 m x 0.5 m subplot, located in the SE corner of the 2 m x 2 m quadrat. Reference plots for each planted site were sampled for species composition and percent cover (figure 1).

The pre-construction elevation survey was conducted by NRCS in May 1995 and tied into the Louisiana South Zone Coordinate system in the National Geodetic Vertical Datum (NGVD) from a known permanent benchmark The second survey was conducted with the one-month post-construction vegetation sampling in July/August 1996 and the third survey was completed by NRCS in July/August 1997. All elevation surveys were conducted using the conventional leveling rod survey technique.

Vertical elevations were collected along transects within the sixth segment from the eastern end of sites A, B, C, and D (figure 6). Beginning 5 ft (1.5 m) from the side spur of the plot, to reduce direct influence of the fence, five transect lines were established at 10 ft (3.0 m) intervals. The two

Figure 4. Typical destruction of fencing and vegetation at Timbalier Island Plantings (TE-18) Demonstration project (photo taken August 1997).

Figure 5. Debris and fencing deposited in segment by wind and wave activity at Timbalier Island Plantings (TE-18) Demonstration project (photo taken August 1997).

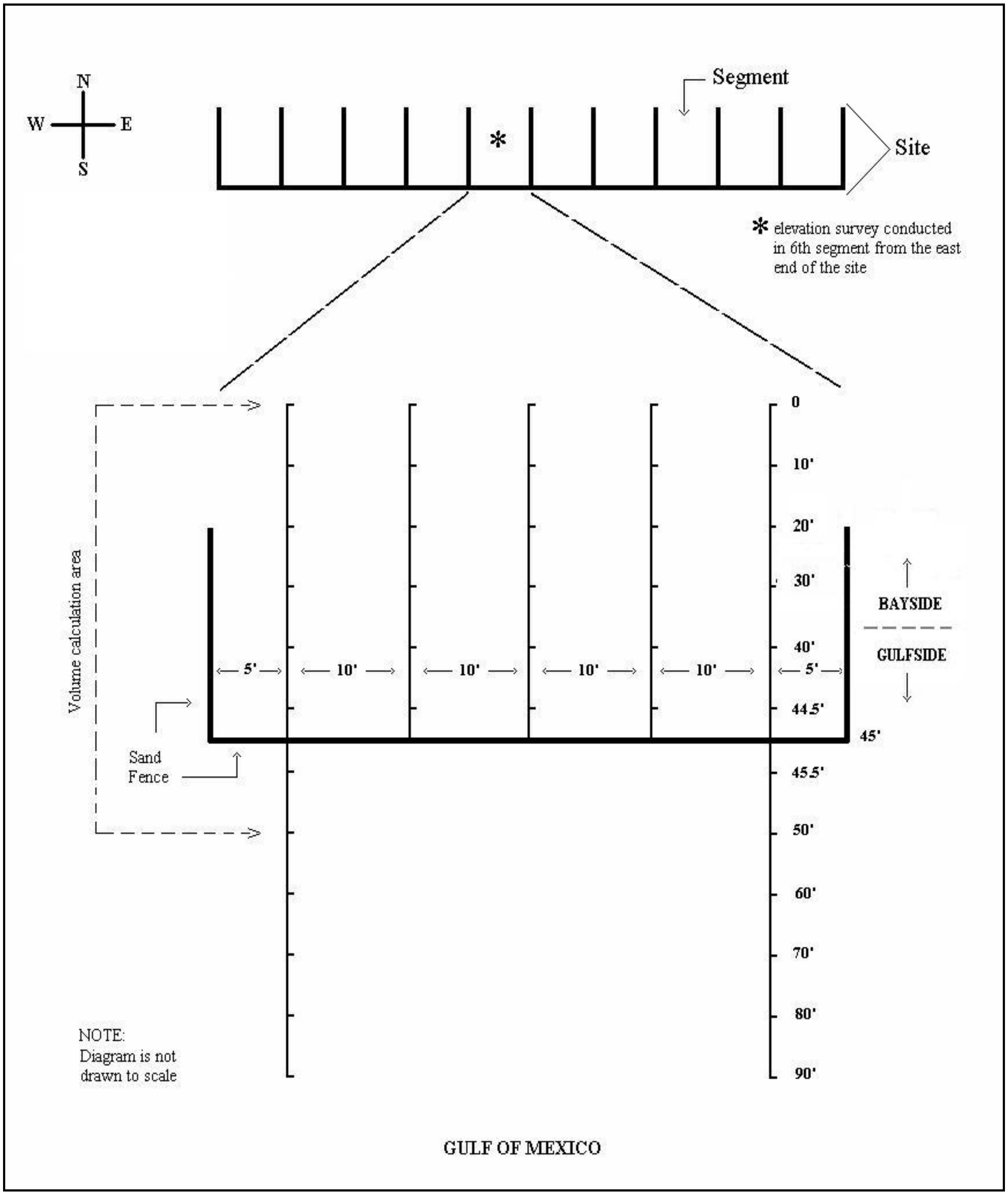

Figure 6. Typical elevational survey schematic within a segment at Timbalier Island Plantings (TE-18) Demonstration project.

outermost lines extended 45 ft (13.7 m) past the fencing onto the beach towards the Gulf of Mexico. Along each transect, elevation measurements were taken at 10 ft (3 m) intervals with additional points at 44.5 ft (13.6 m) and 45.5 ft (13.9 m) to reduce the influence of the fence on the measurements (figure 6). The raw data and blue line drawings from the elevational survey were provided to LDNR/CRD personnel (USDA/NRCS 1997).

A grid model was generated from the elevation data from each of the four fenced segments using ArcView, a geographic information system software package. A surface was interpolated from the elevational data collected in each of the four fenced segments [50 ft x 50 ft (15.2 m x 15.2 m) including the fence] and their associated reference plots (figure 6). This interpolation was accomplished by ArcView's spline algorithm, which fits a minimum-curvature surface through the input survey points (Environmental Systems Research Institute 1996). The mean elevation of this surface was then multiplied by the length and width of the survey segment to calculate the segment's total volume (figure 7). In addition, average change in dune height was calculated from NRCS surveys by averaging the difference between the highest point on each transect line at time *i* and time *i+1* for each plot. This data will be used to compare the effects of sediment fences on sediment trapping and dune development over time.

The National Wetlands Research Center (NWRC) in Lafayette, LA obtained 1:12,000 scale near-vertical color-infrared aerial photography of the Timbalier Island Plantings (TE-18) project area on November 21, 1993. This pre-construction photography was checked for flight accuracy, color correctness, and clarity. The original film was archived, duplicate photography was indexed and scanned at 300 dots per inch. Using ERDAS Imagine, an image processing and geographic information systems (GIS) software package, individual frames of photography were georectified and then assembled into a mosaic (figure 8). The photography is being analyzed to determine pre-construction land-water ratios.

Typically, vegetation data collected in 1996 and 1997 at the Timbalier Island Plantings (TE-18) Demonstration project would be combined for analysis. Since the data set is unbalanced due to loss of numerous segments and complete sites over time, the data comparisons are made within the set for each year using an unbalanced block design. The assumptions of parametric analysis were tested using Statistical Analysis System (SAS) univariate procedure. When the univariate procedure indicated that data was not normally distributed, square root transformation ($y^{½}$) of the data was conducted which resulted in a near-normal distribution. Percent cover, tiller number, and tiller spread were square root transformed for analysis. Data were analyzed with SAS Analysis of Variance (ANOVA) procedure and the least significant difference (LSD) procedure and tested at the 95% confidence level to determine differences among treatments (SAS Institute Inc. 1996). Based on the small p-values produced by the ANOVA, the effect of transforming non-normal data should not diminish the overall conclusions drawn from the analyses. Data were detransformed for presentation.

Results

For the 1996 sample period (1 month post-construction), percent survival of the planted vegetation

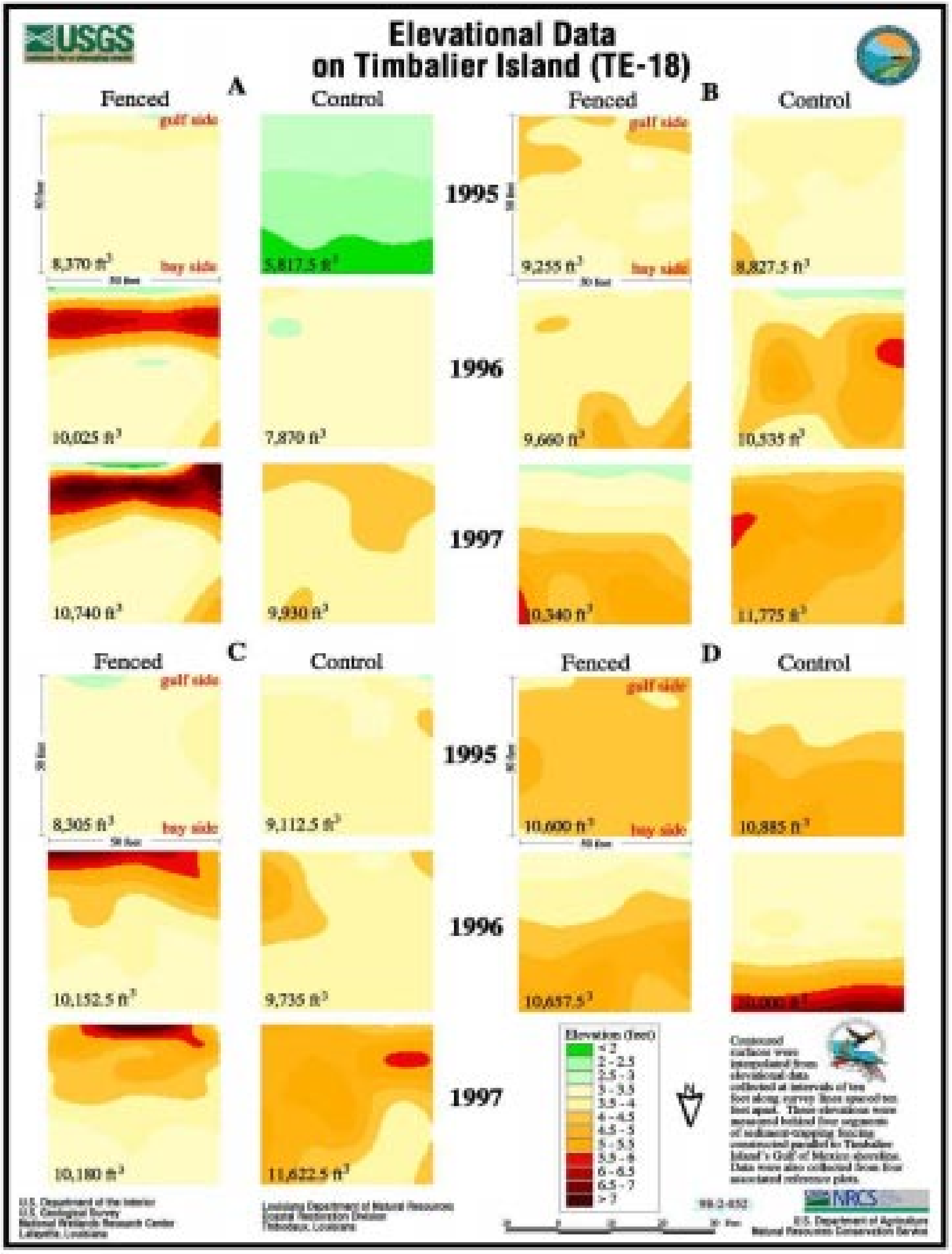

Figure 7. Elevational contours developed from NRCS data with calculated volume changes over time for each fence segment and reference plot surveyed at Timbalier Island Plantings (TE-18) Demonstration project.

Figure 8. Mosaic of November 1993 aerial photography of Timbalier Island produced by NWRC, Lafayette, LA.

was significantly higher (P = 0.0001) within bayside plots than within gulfside plots. Mean percent survival in the bayside plots was 95% or higher while the gulfside plots varied from 57 - 100% (table 1). Survival within fenced sites A, BE, and BW was significantly higher (P = 0.0002) than within unfenced sites I-1 and I-2.

The 1997 vegetation sampling (1 year post-planting) of the remaining sites, A and BW, showed percent survival significantly higher (P = 0.0049) in site A. Bayside percent survival was significantly higher (P = 0.0001) than gulfside percent survival with the bayside percentage ten percent higher than the gulfside (table 1).

For 1 month post-planting, mean percent coverage within the bayside plots was significantly higher (P = 0.0078) than within the gulfside plots. Percent coverage showed a significant (P = 0.0001) location effect. Site I-1 and I-2 had lower percent cover than sites A, BE, and BW with the greatest percent cover in both site A bayside and site BE gulfside and the lowest percent cover in site I-1 gulfside (table 1).

The 1 year post-planting vegetation data indicated no significant differences for mean percent cover between sites A and BW (P = 0.95) nor between bayside and gulfside (P = 0.095). Mean bayside percent cover was 51% while gulfside was 36% (table 1).

Tiller number within the bayside plots was significantly higher (P = 0.0001) than within the gulfside plots 1 month post-planting. There was also a significant location effect (P = 0.0001) on the number of tillers. Mean number of tillers was greatest in site BE gulfside plot and site A bayside plot and least in site I-1 gulfside plot (table 2).

The 1 year post-planting tiller data indicated no significant difference (P = 0.08) between site A and site BW. In addition, the analysis shows no significant difference (P = 0.17) between the bayside and gulfside treatments (table 2).

For 1 month post-planting, lateral tiller spread data indicated significantly greater (P = 0.0038) spread within the bayside plots than within the gulfside plots in 1996 (table 2). The mean lateral spread was 3 in (8 cm) in bayside plots, and 2 in (5 cm) in gulfside plots. As with tiller number, the lateral spread was also affected significantly (P = 0.04) by location. Site BE had the greatest mean lateral spread, 5 in (12 cm) bayside and 4 in (9 cm) gulfside, with site I-2 having the least mean lateral spread, 2 in (5 cm) bayside and 1 in (3 cm) gulfside (table 2).

Lateral tiller spread within sites A and BW indicated no significant difference (P = 0.14) between sites 1 year post-planting, although bayside plots had significantly greater spread (P = 0.02) than the gulfside plots (table 2).

The analysis of vegetation data collected in August 1996 and August 1997 includes only a comparison between sites A and BW, since they were the only sites that remained intact. As with comparison of variables within individual years, the percent cover, tiller number, and tiller spread

Table 1. Mean percent survival and mean percent cover for August1996 (1 month post-planting) and August 1997 (1 year post-planting) vegetation sampling at Timbalier Island Plantings (TE-18) Demonstration project (n = number of plots).

		Mean % Survival		Mean % Cover	
Site	Treatment	1996	1997	1996	1997
A	Bayside	99	99	53	54
A	Gulfside	87	89[c]	22	34
BW	Bayside	95	94	33	44
BW	Gulfside	86	83	26	43
BE	Bayside	100	---[a]	42	---[a]
BE	Gulfside	100	---[a]	51	---[a]
I-1	Bayside	99	---[a]	15	---[a]
I-1	Gulfside	57	---[a]	2	---[a]
I-2	Bayside	97	---[a]	10	---[a]
I-2	Gulfside	95	---[a]	4	---[a]
Mean	**Bayside**	**98** (n = 63)	**98**[b] (n = 39)	**38** (n = 62)	**51**[b] (n = 39)
	Gulfside	**87** (n = 63)	**88**[b] (n = 39)	**22** (n = 63)	**36**[b] (n = 39)

[a] Although vegetation may have been present, data could not be collected due to inability to relocate vegetation plots within damaged fences.
[b] 1997 mean includes only the sites sampled, A and BW.
[c] Dune movement may have resulted in shifting of plot and/or vegetation within the plot resulting in an increased number of plantings within the plot.

Table 2. Mean tiller number and mean lateral spread for 1996 and 1997 vegetation sampling at Timbalier Island Plantings (TE-18) Demonstration project (n = number of tillers).

		Mean Tiller Number		Mean Lateral Spread (cm)	
Site	Treatment	1996	1997	1996	1997
A	Bayside	41	47	9	29
A	Gulfside	13	18	5	19
BW	Bayside	26	22	6	22
BW	Gulfside	16	31	4	17
BE	Bayside	39	---[a]	12	---[a]
BE	Gulfside	41	---[a]	9	---[a]
I-1	Bayside	10	---[a]	8	---[a]
I-1	Gulfside	1	---[a]	1	---[a]
I-2	Bayside	15	---[a]	5	---[a]
I-2	Gulfside	10	---[a]	3	---[a]
Mean	**Bayside**	**32** (n = 122)	**41**[b] (n = 78)	**8** (n = 126)	**28**[b] (n = 72)
	Gulfside	**16** (n = 124)	**22**[b] (n = 78)	**5** (n = 124)	**18**[b] (n = 78)

[a] Although vegetation may have been present, data could not be collected due to inability to relocate vegetation plots within damaged fences.

[b] 1997 mean includes only the sites sampled, A and BW.

data were square root transformed for normality. From the analyses, neither percent survival nor tiller number was significantly different (P = 0.80 and 0.82, respectively) between 1 month post-planting and 1 year post-planting. Conversely, percent cover for the time difference was significant (P = 0.003) as was lateral tiller spread (P = 0.0001).

In 1997, the plant species, *S. patens* or *P. amarum*, was recorded as identification of the plants randomly selected for tiller measurements. Since this variable was not recorded during the 1996 sampling, no analysis of the data was possible. From a visual perspective in the field of the nine segments in Site BW and the twenty-nine (29) segments in site A and a simple mathematical comparison of the means, *S. patens* appears to produce more tillers and has a greater average spread than *P. amarum* (figure 9). Determining the effect of elevation on species' tiller production and spread was not possible since the survey transect in Site B was in the recently destroyed site BE. Future data collection will include noting the plant species as well as the tiller number and tiller length. This will allow better analyses that will provide more definitive answers regarding species differences and potentially where to plant each species when attempting to use vegetation as a stabilizing factor in dune building.

The elevation data collected in 1995, 1996, and 1997 indicates that site A control and site B control showed the greatest cumulative increase in volume of sediment (figure 10). Of the fenced sites, the elevational change in site A is most representative of the dune-building process (figure 11). Site D fenced and control showed the most noticeably different change in volume compared to the other sites (figure 10). Site A fenced, the only fence site not completely destroyed, showed an average rate of accumulation of 1049 ft^3/yr (30 m^3/yr). The site A control plot showed an average accumulation rate of 1896 ft^3/yr (54 m^3/yr). Sites B and C, although damaged, also showed greater accumulation within the control plots than the fenced plots. Site B had a mean accumulations of 513 ft^3/yr (15 m^3/yr) and 1337 ft^3/yr (38 m^3/yr) in the fence and control plots, respectively. Site C had a mean accumulations of 781 ft^3/yr (22 m^3/yr) and 1276 ft^3/yr (36 m^3/yr) in the fence and control plots, respectively (table 3).

Discussion

The results from the fencing and plantings in the Timbalier Island Planting Demonstration (TE-18) project mirror the results of earlier sediment fencing/vegetation planting projects conducted on the island by Mendelssohn et al. (1991). NRCS topographic survey data showed fenced segments averaged 0.9 ft (0.3 m) of dune height increase per year and the control plots averaged 0.7 ft (0.2 m) (table 3). Volumetric accumulation in the control plots averaged 30.1 ft^3/ft/yr (2.8 m^3/m/yr) while the fenced areas only averaged 15.6 ft^3/ft/yr (1.4 m^3/m/yr). Mendelssohn and Hester (1988) found fences accumulated an average of 78% more sediment than unfenced controls on Timbalier Island while this project showed 48% less accumulation in the fenced than in the control plots. The average dune growth within the fences, based upon measurements in one (1) segment, was slightly higher than the dune growth in the Mendelssohn et al. (1991) Timbalier Island fencing project, and below coastal sand fencing projects reported in the literature (Savage and Woodhouse 1969, Dahl et al. 1975, Myer and Chester 1977, Woodhouse et al. 1976, Knutson 1980). Average annual dune growth was 0.9 ft

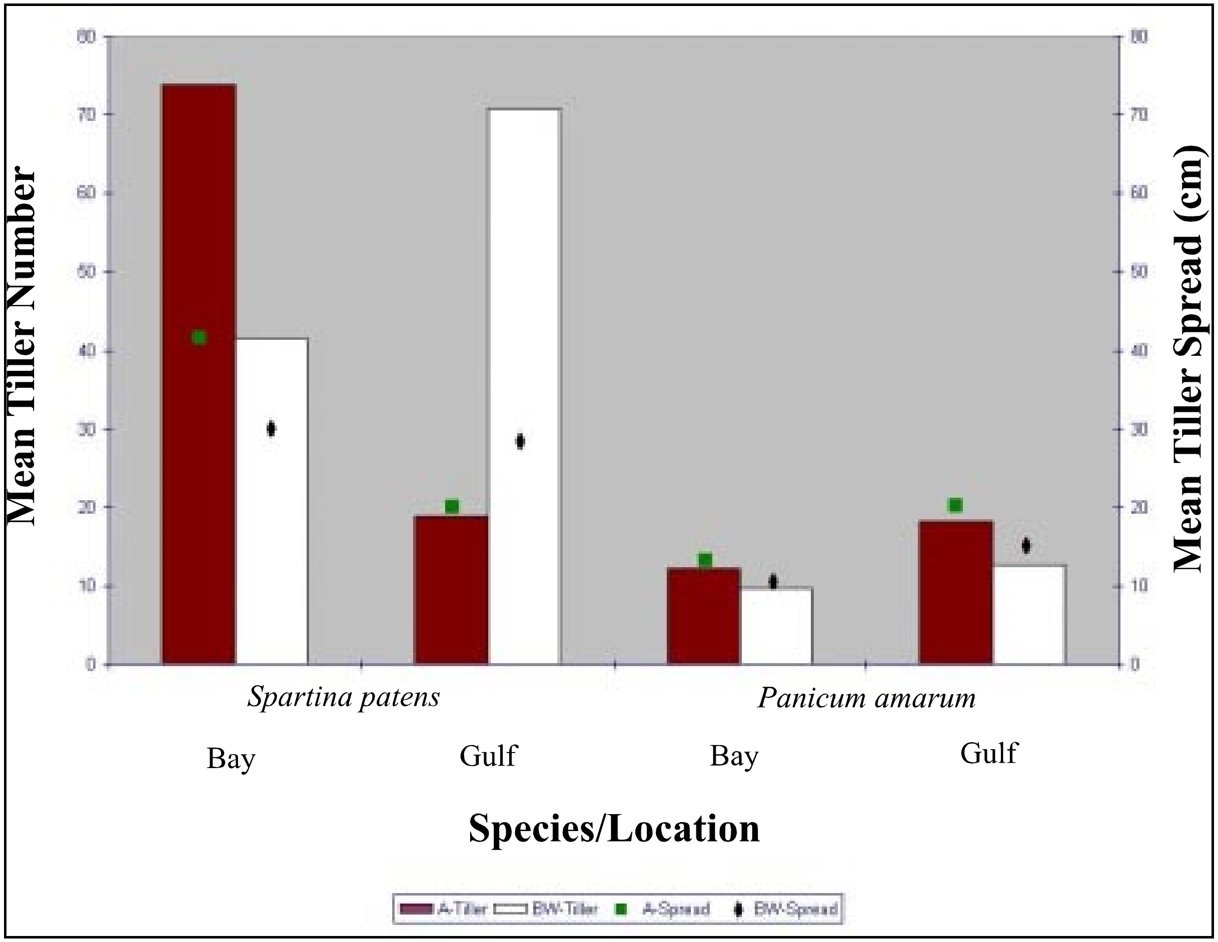

Figure 9. 1997 species tiller number and tiller spread as related to site (location) at Timbalier Island Plantings (TE-18) Demonstration project.

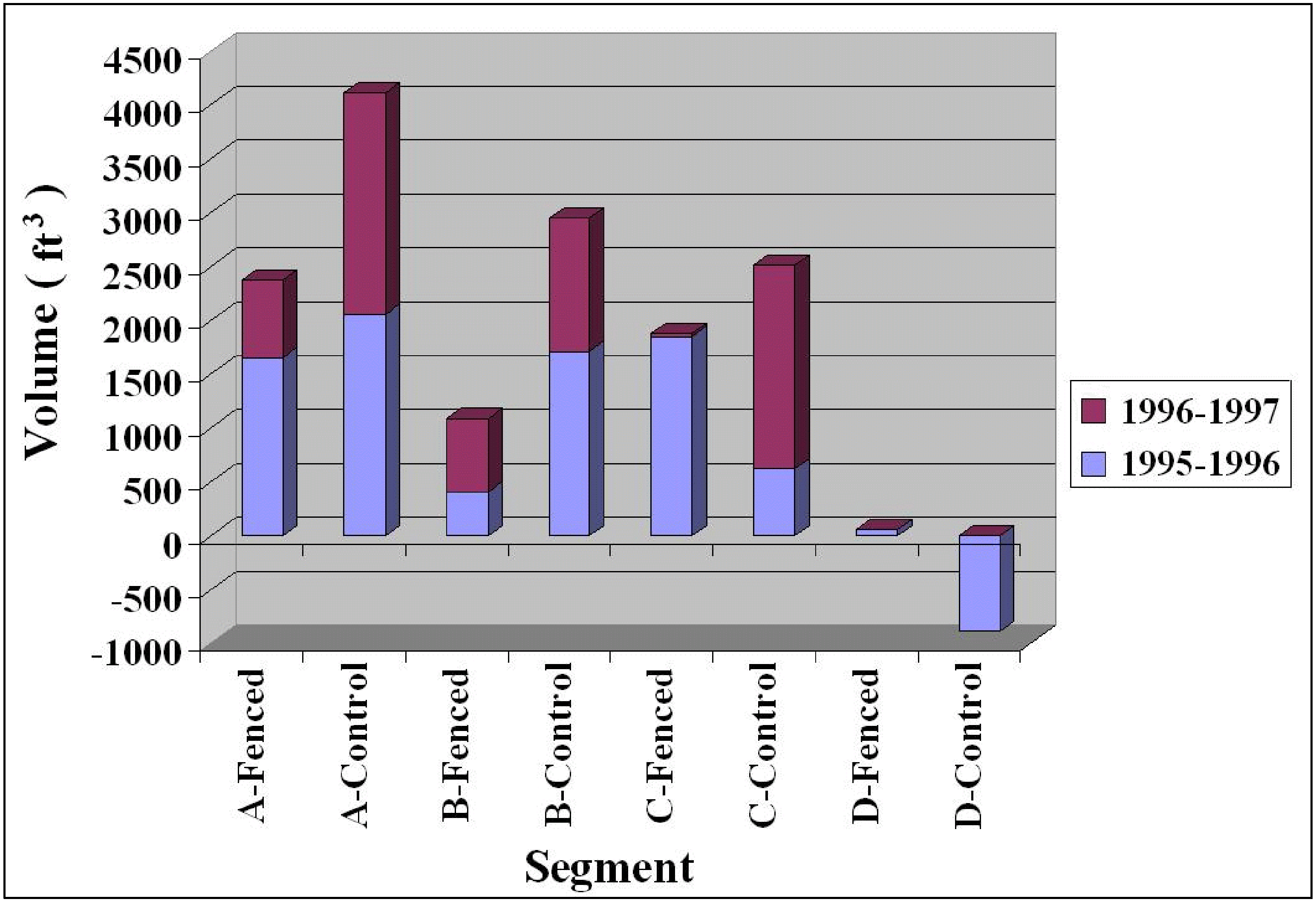

Figure 10. Cumulative volume changes in segments and reference plots (1995 - 1997) at Timbalier Island Plantings (TE-18) Demonstration project.

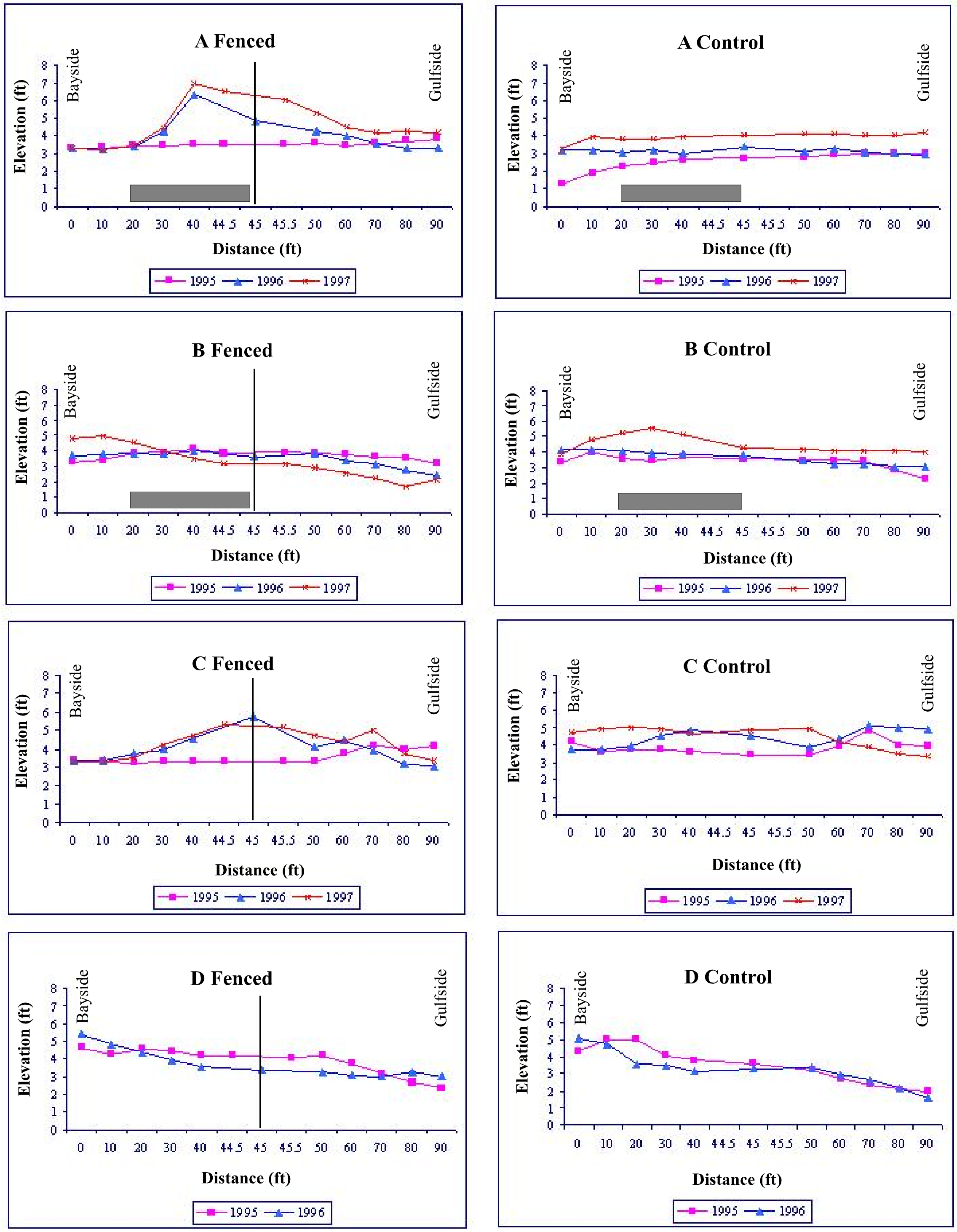

Figure 11. Comparison of elevation changes (1995 - 1997) in one segment and one reference plot per treatment at Timbalier Island Plantings (TE-18) Demonstration project. (Line indicates position of fence and gray area denotes area planted)

Table 3. Change in dune height and volume of sediment per year determined through NRCS elevation surveys (1995 -1997) at Timbalier Island Plantings (TE-18) Demonstration project.

		Change in dune height per year (ft/yr)			Change in volume per year (ft^3/yr)		
Site	**Treatment**	**1995 - 1996**	**1996 - 1997**	**Average**	**1995 - 1996**	**1996 - 1997**	**Average**
A	Fenced/ Planted	2.2	0.8	1.5	1373	724	1049
A	Control	0.5	1.0	0.8	1703	2089	1896
B	Fenced/ Planted	0.2	0.5	0.4	336	689	513
B	Control	1.5	-0.3	0.6	1417	1257	1337
C	Fenced/ Unplanted	1.7	-0.2	0.8	1533	28	781
C	Control	0.6	0.8	0.7	517	1914	1276
D	Fenced/ Unplanted	1.0	---[a]	N/A	53	---[a]	N/A
D	Control	-0.2	---[a]	N/A	-734	---[a]	N/A
Mean	**Fenced**			**0.9** [b]			**781** [b]
	Control			**0.7** [b]			**1503** [b]

[a] Data could not be collected due to inability to re-establish elevation transect lines within damaged fences.
[b] Mean includes only the sites sampled in both years (A, B, and C).

Table 4. Comparison of annual sand accumulation in Massachusetts, North Carolina, Louisiana, Texas, and Oregon sediment fencing projects.

Location	Investigators	Sand Accumulation	
		m^3/m	ft^3/ft
Nauset Beach, Cape Cod, Massachusetts	Knutson	8.3	89.4
Ocracoke Island, North Carolina	Woodhouse, Seneca, and Broome	8.4	90.5
Timbalier Island, Louisiana	Mendelssohn and Hester	0.7 - 4.2	7.5 - 45.2
Padre Island, Texas	Dahl, Fall, Lohse, and Appan	10.8	116.3
Clatsop Plains, Oregon	Myer and Chester	13.7	147.5

(0.3 m) while Mendelssohn et al. (1991) reported annual dune growth of 0.16 - 0.85 ft (0.05 - 0.26 m) on Timbalier Island.

Within fence sites, based upon measurements in one 50 ft (15 m) wide segment, annual sand accumulation was 21 ft^3/linear foot of beach/yr (1.9 m^3/linear m of beach/yr). Mendelssohn et al. (1991) reported sand accumulations of 7.5 - 45.2 ft^3/ft/yr (0.7 - 4.2 m^3/m/yr) on Timbalier Island based on a 15 ft (4.6 m) wide plot. Knutson (1980) reported 89.4 ft^3/ft/yr (8.3 m^3/m/yr) at a dune building project in Cape Cod, and additional studies in North Carolina, Texas, and Oregon reported sand accumulations of 90.5, 116.3, and 147.5 ft^3/ft/yr (8.4, 10.8, and 13.7 m^3/m/yr) respectively (table 4). This project indicates, again, that sand is limited and dune-building is not comparable to East coast projects where sand supplies are greater.

The small sample size and location of most control plots to the west of the fence sites probably contributed to the results (figure 1). Timbalier Island has historically exhibited accretion at the western end, while eroding from the east (Meyer-Arendt and Wicker 1981). Although it might be assumed that increased dune height would correspond with increased volume of sediments, the data collected indicated a different relationship. The dune height increased in the immediate area of the fence which accounts for only a small area of the total plot. In the unfenced, i.e. control plots, the sand seems to accumulate throughout the plot resulting in greater accumulation for the plot.

The percent survival of vegetation transplants, within the undamaged portion of project, were higher than those reported by Mendelssohn and Hester (1988). Mendelssohn and Hester (1991) found *P.*

amarum had a 73 % survival after 15 months, while our study showed 93% survival after 12 months, for *P. amarum* and *S. patens* transplants in all treatments (table 1). Percent survival of the vegetation transplants was significantly different by site (table 1) during the Timbalier Island Planting (TE-18) Demonstration project, as in the Mendelssohn and Hester (1991) study. Soils nutrients were not taken during this study, but Mendelssohn and Hester (1988) did report that soil nutrient status may affect transplant survival. Also differences in herbivory by site were noted to affect percent survival during the Mendelssohn and Hester (1988) study. Lower survival rates (73% after 15 months) reported by Mendelssohn and Hester (1988) could be due to extensive herbivory during their study period. They reported total decimation of *P. amarum* transplants, and reduction in cover of *S. patens*, and *Heterotheca subaxilaris* (camphorweed) of approximately 30 % when compared to vegetation in 16.1 ft^2 (1.5 m^2) exclosures. Herbivore impacts appeared minimal among the plantings in the present project study and herbivore populations may have been significantly impacted by the effects of Hurricane Andrew in 1992.

The increased survival of planted vegetation within the bayside plots, when compared to gulfside plots, may be due to rapid accumulations of sand in the fences. Sand aggradation closer to the fence may have exceeded the transplants' ability to grow in the gulfside segments. Mendelssohn and Hester (1988) noted that the sand fence design used in the Timbalier Island Plantings (TE-18) Demonstration project (figure 2) accumulated the most sand during the first year of construction. However, a straight fence design, without spurs, collected 164% more sand than the design used by NRCS after 3 years (Mendelssohn and Hester 1988). Also, soil moisture may be reduced as dune height increases (Mendelssohn and Hester 1988). Survival also appears to be a function of location since the western sites, A, BE, and BW in 1996 and A in 1997, had higher survival rates than the eastern sites (table 1).

Total plant coverage increased from the time of the 1996 to the 1997 sampling as transplants grew and additional species invaded the area (table 1). Compared to the 1997 measurements, percent coverage was minimal in the first month of growth of the plants. Planting took place in July just prior to the seed production/maturation period of the plants (Radford et al. 1968, USDA/SCS 1981) which may account for the limited amount of growth or coverage produced during the first growing season. In 1996, bayside plant cover was higher than gulfside cover possibly due to the sheltering effect of the fencing and corresponding dunes. After the second growing season, the effect of location and treatment, bay versus gulf, diminished with no significant differences. Additional analysis of the species composition within the sample plots will be evaluated for the next report, to determine the actual impact of the transplants on percent cover. Results from Mendelssohn and Hester (1988), showed that, with time, percent cover was less dependent on transplant survival, as other species colonized the site. They found coverage of >75% in areas with transplant survival of <1% nine months post-planting. Fertilization, a factor positively affecting percent coverage in their study, could effect natural colonization by vegetation without transplants (Mendelssohn and Hester 1988). With only sites A and BW remaining in 1997, the close proximity of the western sites decreased the effect of location on percent cover.

Comparisons of tiller production, i.e. tiller number, and lateral spread, by the transplanted vegetation, one month after planting and after one year of growth, shows the same relationship to location as survival and percent cover. Bayside plots, 1 month post-planting, exhibited greater tiller numbers and lateral spread than gulfside plots. However, within 1 year post-planting, no significant differences in tiller number by location were determined in the remaining treatments (table 2). Lateral spread within the bayside plots remained significantly higher between sample times, indicating that transplants spread better when tillers are produced early and then they grow. The gulfside plots seem to produce as many tillers given enough time, however, they have not spread as far within 1 year post-planting as those plants in the bayside plots.

Conclusions

Vegetation planting results indicate a good survival of both *P. amarum* and *S. patens* when the segment remained intact. The differences in bayside and gulfside plots may indicate potential benefits from delayed or no planting in the area closest to the fences, and planting 20 ft (6 m) behind the fences. Once the dune is formed, fertilization or transplantation may be more effective. Additional data on species composition, and comparisons of individual species performance from remaining treatments should provide data which may determine the better species to plant.

Preliminary results from the first year of the project indicate that sediment fencing and vegetative plantings, as in numerous other studies, can be used to trap sand and build a dune (Savage and Woodhouse 1969, Dahl et al. 1975, Myer and Chester 1977, Woodhouse et al. 1976, Knutson 1980, Mendelssohn and Hester 1988, Mendelssohn et al. 1991, Hester and Mendelssohn 1992). However, preliminary results also appear to confirm Mendelssohn and Hester's (1988) conclusion that the only way to maintain a vegetated dune on Louisiana's barrier islands is through maintenance of a beach wide enough to dissipate wave energies. A well established dune cannot prevent the natural transgression of the shoreline, and will eventually erode as the shoreline narrows. This is evidenced by the fact that all treatments have eroded from east to west, as the barrier island's natural process of westward erosion occurs (Meyer-Arendt and Wicker 1981). The dunes do serve as a sand reservoir during high tides and waves providing sediment to the dynamic beach profile (Van der Meulan and Gourlay 1969, Leatherman 1979a, b, c). The continued monitoring of the remaining fences should provide more information on how dunes that have been established for longer periods of time respond to shoreline erosion.

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